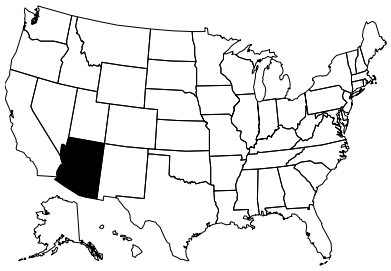
ARIZONA



Contact Information

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Program Description

The Biocriteria Program at the Arizona Department of Environmental Quality (ADEQ) has been sampling benthic macroinvertebrates since 1992. Data has been collected for biocriteria standards development and 305(b) assessment purposes for the past ten years. ADEQ has only one dedicated biocriteria staff person, however six other water quality monitoring staff assist in biological data collection during the spring as part of the ambient watershed monitoring program.

ADEQ does not yet have narrative or numeric biocriteria. However, sampling methods and Indexes of Biological Integrity have been developed with the assistance of USEPA and contractor support. The cold and warm water Indexes of Biological Integrity will be used to support two designated uses, Aquatic and Wildlife (cold water fishery) (A&Wc) and Aquatic and Wildlife (warm water fishery) (A&Ww), which are currently listed in Arizona's surface water quality standards. ADEQ plans to develop a narrative biocriterion for the next triennial review of standards and these indexes will serve as the implementation guidance for such a standard. ADEQ has also developed an approach to using bioassessments plus habitat assessments to implement the narrative bottom deposit standard, which will be proposed during a separate rulemaking on implementation guidance documents for all narrative standards during 2002.

In the water quality standards rules that are currently under review by USEPA, ADEQ has updated definitions for A&Wc and A&Ww based upon "macroinvertebrate regions" identified in Spindler 2001. The 5000' elevation contour marks the threshold for a change in community type from warm to cold, as determined by statistical analysis of empirically derived statewide biological data. These macroinvertebrate regions will be used instead of ecoregions for predicting community types in Arizona. Addition of the elevation range in the A&Wc and A&Ww standards definitions allows Arizona to use the elevation model to better predict the correct A&W use type. Revisions to the "list of surface waters and designated uses" have correspondingly been made in the 2001 standards rule.

ADEQ does not have a biocriteria standard and has subsequently been unable to assess biological integrity in Arizona's 305(b) report or 303(d) list. As a result of a lawsuit, ADEQ is preparing an "impaired waters rule" this year which will specifically outline assessment and listing procedures. Rules for conducting bioassessments will also have to be developed as part of this impaired waters rule, in addition to the surface water quality standard before bioassessments can be fully implemented in our assessment and listing process in Arizona. ADEQ is also partnering with the US Forest Service and Bureau of Land Management to standardize macroinvertebrate sample collection and analysis methods in order to share data on this important ecosystem indicator.

Future program directions include refining narrative bottom deposit standard implementation guidance for rule development, developing narrative biocriterion, starting a diatom bioassessment pilot project, refining reference condition, and developing bioassessments for intermittent streams and large rivers.

Documentation and Further Information

Status of Water Quality In Arizona - Clean Water Act Section 305(b) Report: June 2000:
http://www.adeq.state.az.us/environ/water/assess/305/index.html

Draft Status of Water Quality in Arizona - 2002, Arizona's Integrated 305(b) Assessment and 303(d) Listing Report:
http://www.adeq.state.az.us/environ/water/assess/hsa.html#draft

WQD Biocriteria Program information: http://www.adeq.state.az.us/environ/water/assess/monit.html

ADEQ. 2001. *DRAFT Quality Assurance Program Plan for the Biocriteria Program. ADEQ*, Phoenix, AZ.

Spindler, P.H. 2001. *DRAFT Narrative bottom deposit standard implementation guidelines for Arizona*. ADEQ, Phoenix, AZ.

Spindler, P.H., 1996. *Using ecoregions for explaining macroinvertebrate community distribution among reference sites in Arizona*, 1992. ADEQ OFR-95-7, Phoenix, AZ.

Other accomplishments include macroinvertebrate community distribution among reference sites in AZ (2001), development of Arizona EDAS biological database (2001), development and testing of a biological index for coldwater streams of AZ (2000), development and testing of a biological index for warmwater streams of AZ (1998), and Macroinvertebrate Photocatalog on CD (1998).

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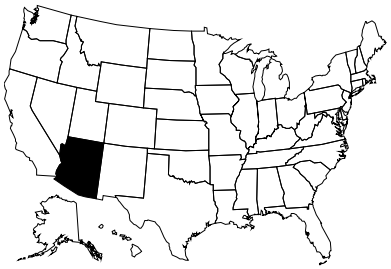

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Programmatic Elements

Uses of bioassessment within overall water quality program	✓	problem identification (screening)
	UD	nonpoint source assessments
	UD	monitoring the effectiveness of BMPs
	✓	ALU determinations/ambient monitoring
	UD	promulgated into state water quality standards as biocriteria
		support of antidegradation
	✓	evaluation of discharge permit conditions
	✓	TMDL assessment and monitoring
		other:
Applicable monitoring designs	✓	targeted (i.e., sites selected for specific purpose) *(special projects, specific river basins or watersheds)*
	✓	fixed station (i.e., water quality monitoring stations) *(comprehensive use throughout* jurisdiction)
		probabilistic by stream order/catchment area
		probabilistic by ecoregion, or statewide
	✓	rotating basin *(specific river basins or watersheds)*
		other:

Stream Miles

Total miles	**127,505**
Total perennial miles	4,980
Total miles assessed for biology*	**0**
fully supporting for 305(b)*	n/a
partially/non-supporting for 305(b)*	n/a
listed for 303(d)*	n/a
number of sites sampled	324
number of miles assessed per site	site specific

*Arizona does not have formal biocriteria and will not be using bioassessments in the 2002 305(b) or 303(d) reports. However, a proposal to use bioassessment plus habitat assessment as the implementation procedure for the narrative bottom deposit standard will be considered during a rulemaking (2002-03), which is separate from the just completed triennial review of standards. The next 305(b) report may include bioassessments in support of the narrative bottom deposit standard, if this implementation procedure is approved.

Aquatic Life Use (ALU) Designations and Decision-Making

ALU designation basis	Warm water vs. Cold Water	
ALU designations in state water quality standards	Aquatic and Wildlife (A&W) cold, A&W warm, A&W-effluent dependent water, A&W-ephemeral (AZ has acute and chronic categories for each except ephemeral in which only acute applies.)	
Narrative Biocriteria in WQS	under development – ADEQ has developed a cold water and warm water Index of Biological Integrity to support these two designated uses, which are currently listed in the surface water quality standards. However ADEQ does not yet have established biocriteria. These indexes will become the implementation guidance for proposed biocriteria in the next triennial review of standards.	
Numeric Biocriteria in WQS	none	
Uses of bioassessment data in integrated assessments with other environmental data (e.g., toxicity testing and chemical specific criteria)	UD	assessment of aquatic resources
	UD	cause and effect determinations
	UD	permitted discharges
	✓	monitoring (e.g., improvements after mitigation)
		watershed based management
Uses of bioassessment/ biocriteria in making management decisions regarding restoration of aquatic resources to a designated ALU	none	

Reference Site/Condition Development

Number of reference sites	**89 total**	
Reference site determinations		site-specific
		paired watersheds
	✓	regional (aggregate of sites)
		professional judgment
		other:
Reference site criteria	For initial site selection, the following guidelines were used in the early 1990s: a site must be accessible (within a 2-hour walk or 3-4 miles from nearest 4-wheel drive road), > 0.5 km downstream of road crossings, no known discharges upstream, no major impoundments upstream, no channel alterations at the site, and be only minimally impacted by land use activities and nonpoint sources. All of the following criteria must be attained in the field assessment of potential sites for a site to be accepted as reference: site should be truly perennial (indicators: fish, univoltine insects, riparian indicators), site should be free of local land use impacts, site should be free of channel alterations, no violations of pH or dissolved oxygen water quality standards, and habitat assessment index score > 14 using ADEQ's 2001 5-parameter habitat index.	
Characterization of reference sites within a regional context		historical conditions
	✓	least disturbed sites
		gradient response
	✓	professional judgment
	✓	other: minimally disturbed
Stream stratification within regional reference conditions		ecoregions (or some aggregate)
	✓	elevation
		stream type
		multivariate grouping
		jurisdictional (i.e., statewide)
		other:
Additional information	✓	reference sites linked to ALU
		reference sites/condition referenced in water quality standards
	✓	some reference sites represent acceptable human-induced conditions

Field and Lab Methods

Assemblages assessed	✓	benthos *(<100 samples/year; single season, multiple sites - watershed level)*
		fish
	✓	periphyton *(<100 samples/year; single season, multiple sites - watershed level)*
		other:
Benthos		
sampling gear		d-frame net; 500 micron mesh
habitat selection		riffle/run (cobble)
subsample size		500 - 600 count target
taxonomy		combination level; EPT taxa are identified to genus or species
Periphyton		
sampling gear		**natural substrate**: brushing/scraping device (razor, toothbrush, etc.) **artificial substrate**: microslides or other suitable substratum
habitat selection		riffle/run (cobble); artificial substrate
sample processing		taxonomic identification
taxonomy		diatoms only; identified at species level
Habitat assessments		visual based, quantitative measurements, hydrogeomorphology; performed with bioassessments
Quality assurance program elements		standard operating procedures, quality assurance plan, periodic meetings, training for biologists, sorting and taxonomic proficiency checks, and specimen archival

Data Analysis and Interpretation

Data analysis tools and methods		summary tables, illustrative graphs
		parametric ANOVAs
		multivariate analysis
	✓	biological metrics *(aggregate metrics into an index)*
		disturbance gradients
		other:
Multimetric thresholds		
transforming metrics into unitless scores		95th percentile of reference population
defining impairment in a multimetric index		25th percentile of reference population
Evaluation of performance characteristics*	✓	repeat sampling *(duplicate samples collected for 10% of sites annually)*
		precision
	✓	sensitivity (*standard level of identification used by lab)*
	✓	bias *(ADEQ uses a standard mesh size, the lab locates small organisms, using a 6-12x dissecting microscope and a Caton tray to randomly obtain fractions of the total sample)*
	✓	accuracy *(any questionable identifications are sent to nationally recognized taxonomic experts for confirmation and a voucher specimen collection is maintained*)
Biological data		
Storage		AZ-EDAS
Retrieval and analysis		Systat, EDAS

*Though multiple performance characteristics are evaluated, ADEQ has not incorporated this information into a QA/QC document.